CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY
Environmental Services Department

South Bay Monitoring Program
2003 Progress Report
January, 2004

Program History

In February 1997, the City of San Jose began measuring total and dissolved copper and nickel concentrations at ten stations in the Lower South San Francisco Bay (LSSB). In October 1997, two fresh water stations were added, one in each of the lower reaches of Coyote Creek and the Guadalupe River, bringing the total number of stations to twelve (Figure 1). Samples were taken in triplicate twice monthly until October 1998, at which time sampling frequency was reduced to monthly, with quarterly triplication. In 2001, triplication was ceased and single monthly samples have been collected since. To date, the City of San Jose has conducted over one hundred sampling events and analyzed over 2000 water samples for total and dissolved copper and nickel.

In 2003, the sampling designs prescribed by the Copper and Nickel Action Plans resulting from the South Bay TMDL Program were incorporated into the San Jose/Santa Clara Water Pollution Control Plant's reissued NPDES permit (order number R2 2003-0085) as provision 9. Ten locations in South San Francisco Bay are monitored to compare mean dry season dissolved copper and nickel concentrations to respective trigger levels. For dissolved copper, Phase I and II trigger levels are 4.0 and 4.4 parts per billion for, respectively. For dissolved nickel, the corresponding trigger levels are 6.0 and 8.0 parts per billion. Indicator stations for copper monitoring are SB03, SB04, SB05, SB07, SB08, and SB09. Indicator stations for nickel monitoring are SB03, SB06, SB07, SB08, SB09, and SB10. Continued sampling at SB01, SB02, SB11, and SB12, and wet season sampling are undertaken to facilitate future power analyses and periodic evaluation of monitoring program performance. Figure 1 shows the station locations for the program.

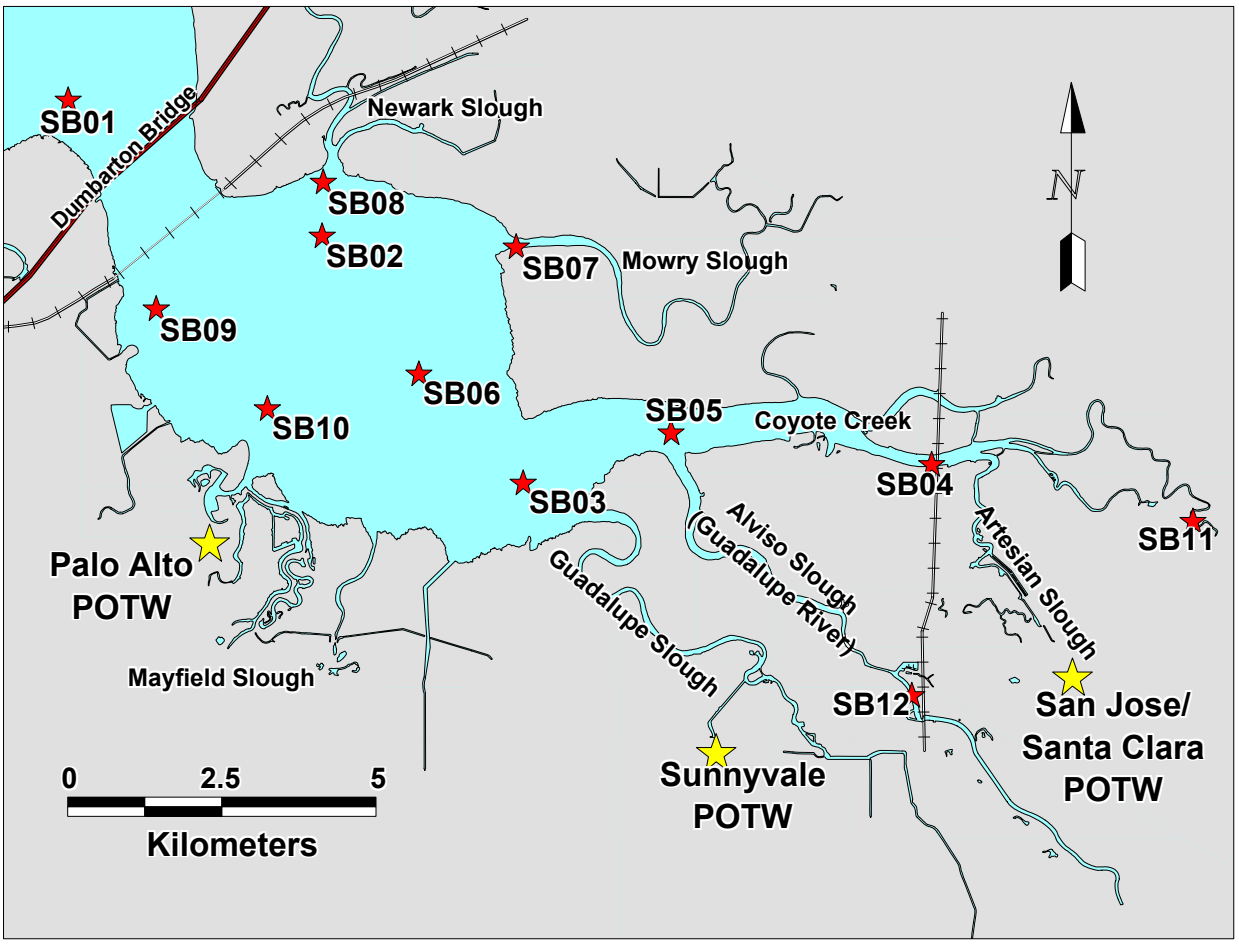
2003 Monitoring Highlights

Dissolved copper and nickel concentrations in the LSSB have remained remarkably constant since 1997. No distinct trend is evident in the yearly mean concentration values, however the trend of increase or decrease has been consistent between copper and nickel. This tendency corresponds with smaller scale correlation between event concentration means over wet and dry seasons (Figure 2). In over six years of monitoring, dry weather indicator station means for copper and nickel have varied less than 0.5 ppb around their respective grand means of 3.14 (Figure 3) and 4.34 ppb (Figure 4). Dry season event concentration means are summarized in Tables 1 & 2.

Mean concentration values for the dry season remain below these levels. Seasonal indicator means for copper have ranged from 2.83 to 3.54 ppb. Seasonal indicator means for nickel range from 4.10 to 4.63 ppb. Summary statistics for individual monitoring stations over the entire study, including wet seasons, are shown in Tables 3 & 4.

The August sample from Station SB05 was omitted from data analysis due to apparent filter breakthrough. Sediment was discovered in the filtered sample at the time of analysis, and analytical results were higher than the corresponding unfiltered sample. These conditions disqualified the sample. This removal affected only the calculations for copper, since station SB05 is not among the indicator stations for nickel. Had the sample been included however, the dry season means would still have remained below the Phase I trigger levels.

Figure 1. South Bay Monitoring Stations



SITE	LAT	LON
SB01	37° 30.782'	122° 8.036'
SB02	37° 29.595'	122° 5.243'
SB03	37° 27.437'	122° 3.033'
SB04	37° 27.600'	121° 58.540'
SB05	37° 27.875'	122° 1.406'
SB06	37° 28.390'	122° 4.180'
SB07	37° 29.499'	122° 3.110'
SB08	37° 30.066'	122° 5.231'
SB09	37° 28.959'	122° 7.068'
SB10	37° 28.087'	122° 5.846'
SB11	37° 27.150'	121° 55.501'
SB12	37° 25.574'	121° 58.778'

Figure 2. Dissolved Copper and Nickel Event Means

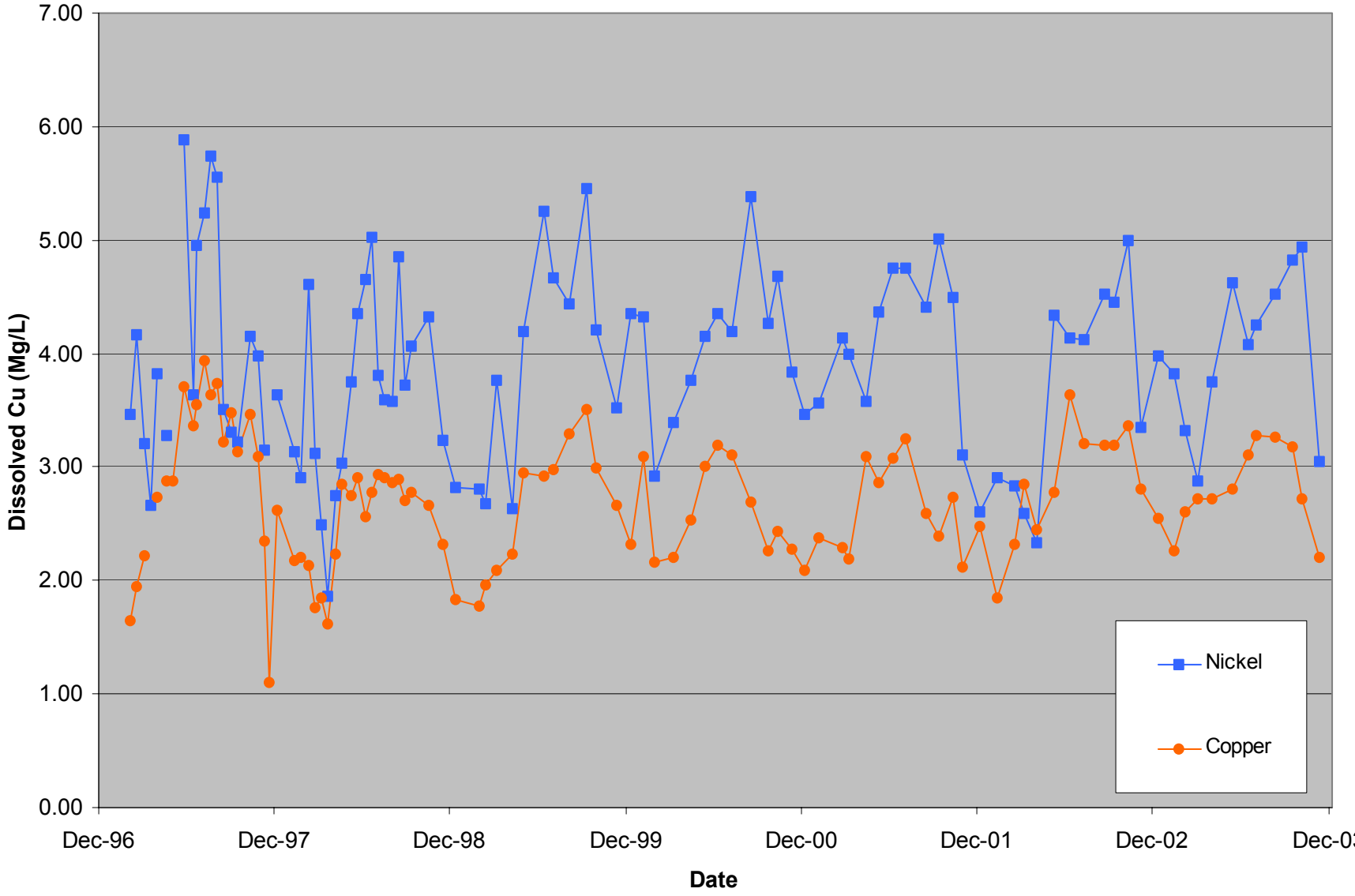


Figure 3. Dry Weather Dissolved Copper Means for Indicator Stations

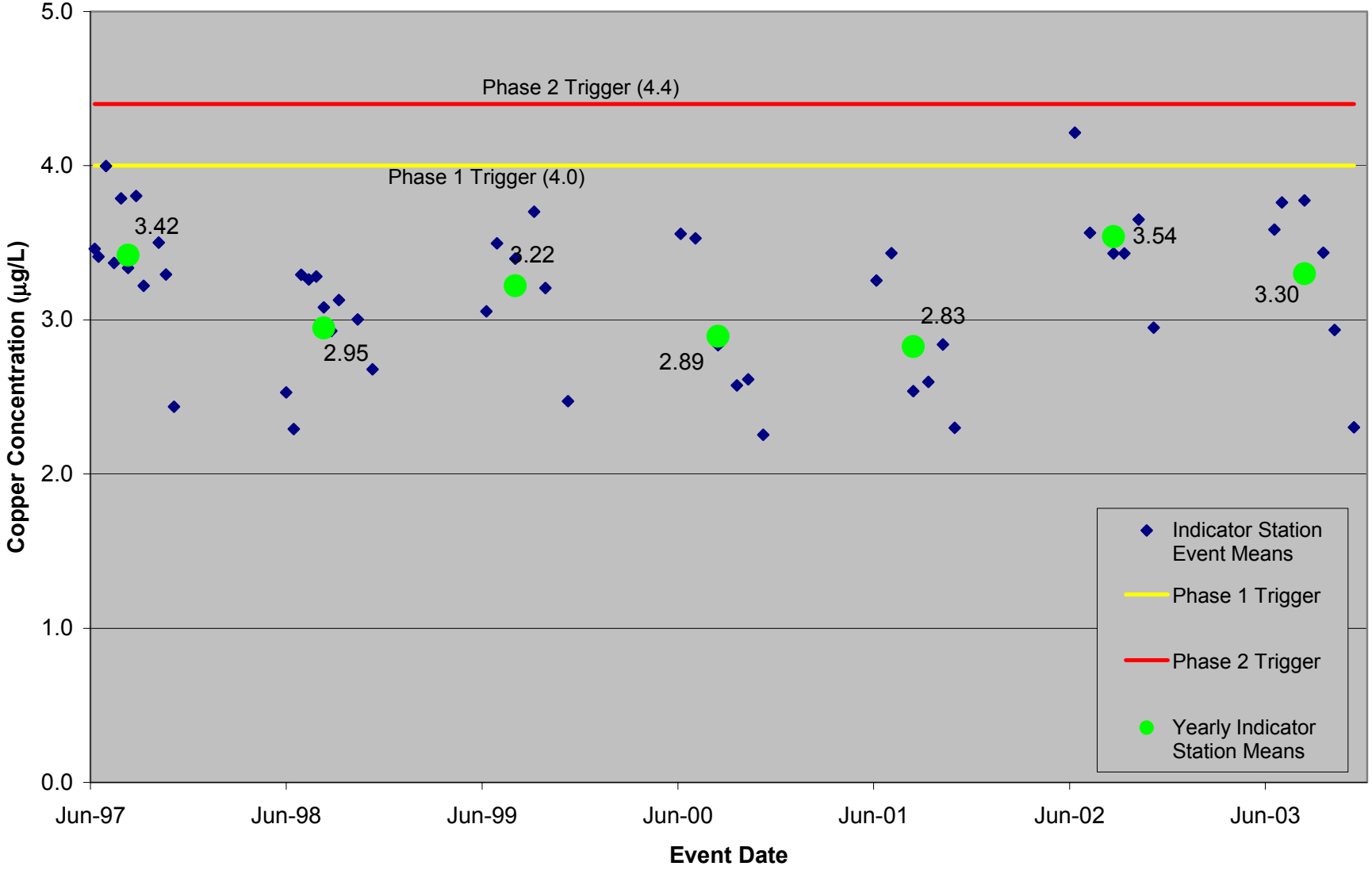


Figure 4. Dry Weather Dissolved Nickel Means for Indicator Stations

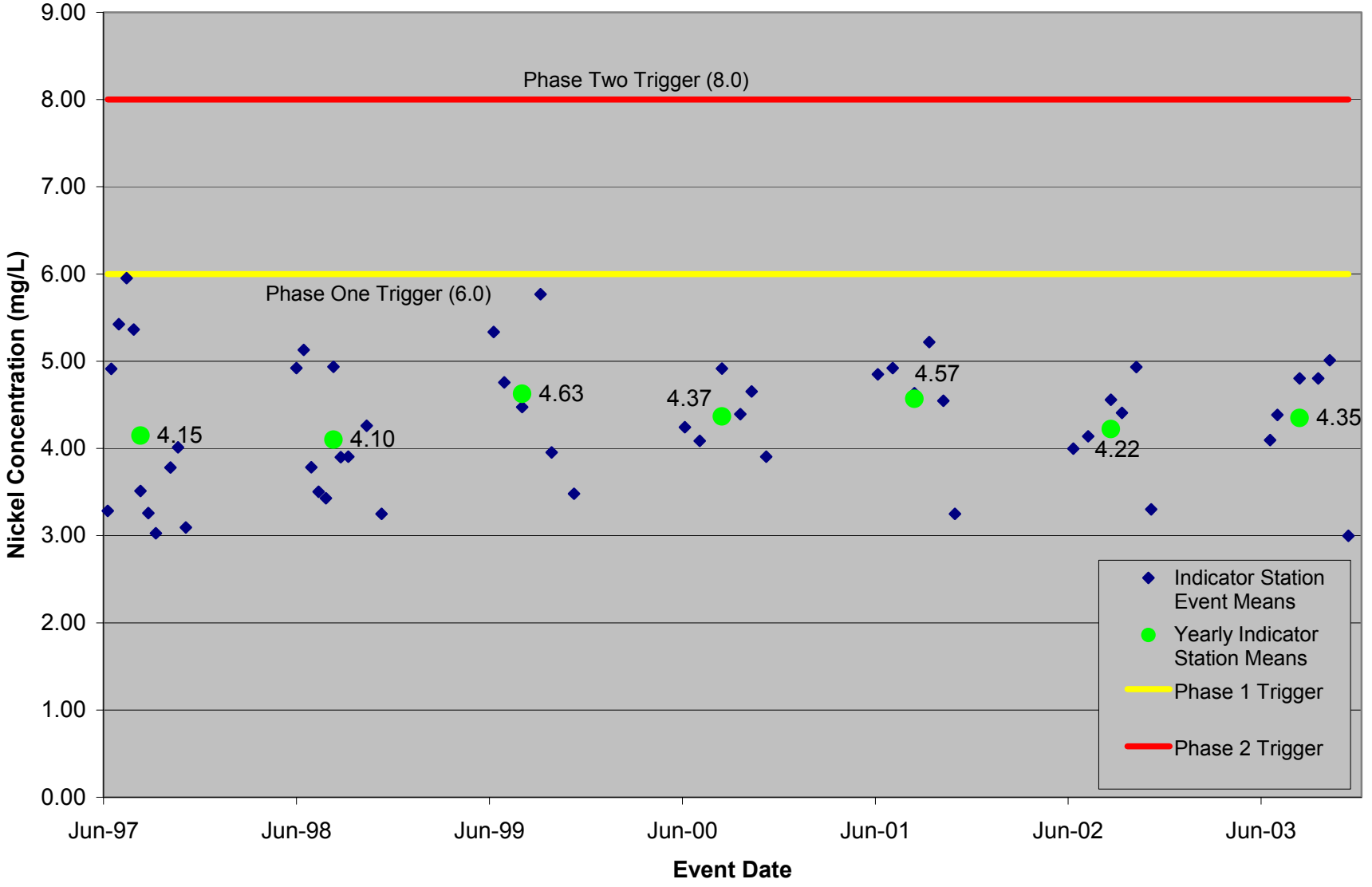


Table 1. Dry Weather Copper Means

Event Date	*Event Mean (All Stations)*	*Indicator Station* Means*	*Dry Year Indicator Mean*
6/17/97	3.37	3.46	
6/24/97	3.56	3.41	
7/8/97	3.94	4.00	
7/23/97	3.64	3.37	
8/5/97	3.73	3.79	
8/18/97	3.21	3.34	3.42
9/2/97	3.48	3.80	
9/16/97	3.13	3.22	
10/14/97	3.46	3.50	
10/28/97	3.09	3.29	
11/12/97	2.34	2.44	
11/23/97†	1.10		
6/9/98	2.56	2.53	
6/23/98	2.77	2.29	
7/7/98	2.93	3.29	
7/21/98	2.91	3.26	
8/4/98	2.86	3.28	
8/18/98	2.89	3.08	2.95
9/1/98	2.70	2.93	
9/15/98	2.78	3.13	
10/20/98	2.66	3.00	
11/17/98	2.32	2.68	
6/17/99	2.91	3.05	
7/7/99	2.97	3.50	
8/10/99	3.29	3.40	3.22
9/14/99	3.51	3.70	
10/5/99	2.99	3.21	
11/16/99	2.66	2.47	
6/13/00	3.19	3.56	
7/11/00	3.11	3.53	
8/22/00	2.70	2.83	2.89
9/26/00	2.26	2.58	
10/17/00	2.43	2.61	
11/14/00	2.28	2.25	
6/13/01	3.08	3.25	
7/11/01	3.24	3.43	
8/21/01	2.59	2.54	2.83
9/18/01	2.39	2.60	
10/15/01	2.74	2.84	
11/6/01	2.12	2.30	
6/18/02	3.63	4.21	
7/16/02	3.21	3.56	
8/29/02	3.20	3.43	3.54
9/18/02	3.20	3.43	
10/15/02	3.36	3.65	
11/12/02	2.81	2.95	
6/25/03	3.11	3.58	
7/9/03	3.27	3.76	
8/20/03	3.27	3.77	3.30
9/24/03	3.18	3.44	
10/16/03	2.72	2.93	
11/20/03	2.20	2.30	

*Indicator Stations: SB03, SB04, SB05, SB07, SB08, SB09
†Station SB12 only

Table 2. Dry Weather Nickel Means

Event Date	Event Mean (All Stations)	Indicator Station* Means	Dry Year Indicator Mean
6/17/97	3.64	3.28	
6/24/97	4.96	4.91	
7/8/97	5.25	5.42	
7/23/97	5.75	5.95	
8/5/97	5.56	5.37	
8/18/97	3.75	3.51	4.15
9/2/97	3.36	3.26	
9/16/97	3.22	3.03	
10/14/97	4.64	3.78	
10/28/97	4.20	4.01	
11/12/97	3.15	3.09	
11/23/97†	3.67		
6/9/98	4.52	4.92	
6/23/98	5.02	5.13	
7/7/98	3.68	3.79	
7/21/98	3.59	3.50	
8/4/98	3.44	3.43	
8/18/98	4.52	4.94	4.10
9/1/98	3.54	3.90	
9/15/98	4.07	3.90	
10/20/98	4.01	4.26	
11/17/98	3.07	3.25	
6/17/99	4.90	5.34	
7/7/99	4.33	4.76	
8/10/99	4.69	4.47	4.63
9/14/99	5.01	5.77	
10/5/99	4.24	3.96	
11/16/99	3.60	3.48	
6/13/00	4.35	4.24	
7/11/00	3.93	4.09	
8/22/00	4.87	4.92	4.37
9/26/00	3.97	4.39	
10/17/00	4.40	4.65	
11/14/00	3.90	3.91	
6/13/01	4.50	4.85	
7/11/01	4.35	4.92	
8/21/01	4.07	4.63	4.57
9/18/01	4.61	5.22	
10/15/01	4.57	4.55	
11/6/01	3.28	3.25	
6/18/02	3.81	4.00	
7/16/02	3.78	4.14	
8/28/02	4.17	4.56	4.22
9/18/02	4.36	4.41	
10/15/02	4.98	4.93	
11/12/02	3.56	3.30	
6/25/03	4.08	4.10	
7/9/03	4.25	4.38	
8/20/03	4.52	4.66	4.33
9/24/03	4.82	4.80	
10/16/03	4.94	5.01	
11/20/03	3.05	3.00	

*Indicator Stations: SB03, SB06, SB07, SB08, SB09, SB10

†Station SB12 only

Table 3. Dissolved copper summary statistics for all stations and seasons 1997 - 2003

Station	*SB01*	*SB02*	*SB03*	*SB04*	*SB05*	*SB06*	*SB07*	*SB08*	*SB09*	*SB10*	*SB11*	*SB12*	*GRAND*
Mean	2.63	2.78	2.84	2.65	2.79	2.93	2.89	2.94	2.98	3.10	1.79	1.58	**2.68**
SE	0.07	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.08	0.09	0.08	0.12	**0.03**
MIN	1.41	1.51	1.26	1.43	1.54	1.23	1.49	1.50	1.52	1.60	0.90	0.70	**0.70**
MAX	4.07	4.63	4.09	4.26	4.67	4.33	4.17	4.42	5.07	4.75	3.73	6.75	**6.75**
n	86	84	84	83	85	84	85	86	86	85	73	74	**909**

Table 4. Dissolved nickel summary statistics for all stations and seasons 1997 - 2003

Station	*SB01*	*SB02*	*SB03*	*SB04*	*SB05*	*SB06*	*SB07*	*SB08*	*SB09*	*SB10*	*SB11*	*SB12*	*GRAND*
Mean	2.83	3.19	3.85	5.96	4.71	3.63	4.28	3.56	3.36	3.65	3.56	3.56	**3.95**
SE	0.06	0.08	0.10	0.17	0.14	0.10	0.14	0.09	0.08	0.09	0.17	0.15	**0.04**
MIN	1.54	1.58	1.80	2.35	1.74	1.56	2.24	1.74	1.70	1.87	1.93	1.35	**1.35**
MAX	3.81	5.29	6.59	13.37	7.59	6.59	10.10	5.97	5.72	6.09	8.62	9.62	**13.37**
n	94	95	94	97	95	96	94	95	96	92	81	82	**1017**